

detonations. They were preceded by very vivid flashes of lightning of various colors, the interval between the flashes and the report being almost imperceptible. For about one hour and forty-five minutes (during which time no rain fell) the reports continued in rapid succession. At 5.45 a. m. it began to rain and the electrical disturbances ceased. Heavy showers of rain continued at intervals until 12.15 p. m., when it cleared off, the rainfall amounting to 1.26 inches. No damage resulted from the storm in this vicinity. For several days preceding the storm the atmosphere was noticeable for its unusual sultriness, and at 2 a. m. of the 27th the sky was overspread with a thin film, forming faint halos around the more brilliant stars. The thickness of the clouds rendered it intensely dark for an hour after the time for daylight.

New York City.—During the storm of the 28th numerous signs and chimneys were blown down, and vessels in the harbor dragged anchor. Other slight damage was reported from surrounding localities.

Pittsfield, Berkshire county, Massachusetts.—A violent westerly gale prevailed here on the 28th. Many trees and chimneys were blown down, and the roofs of several buildings were blown off. Buildings were also damaged at East Douglass and Milford, in Worcester county.

Sandy Hook, New Jersey.—The schooner "Kate E. Gilford" was blown ashore at 4 a. m. of the 28th; she was hauled off on the 30th, having sustained but slight injury.

Narragansett Pier, Rhode Island.—The schooner "Belle O'Neal" was driven ashore one mile north of Whole Rock light-house during a westerly gale at 4 a. m. of the 27th; she was hauled off at 8 p. m. of the same date, being damaged to the extent of \$300.

NAVIGATION.

STAGE OF WATER IN RIVERS.

The Ohio river at Pittsburg, Pennsylvania, rose eleven feet and eight inches during the forty-eight hours ending at 2 p. m. on the 25th, and on that date reached its highest stage—eighteen feet and nine inches above low-water mark—or within one foot and three inches of the danger-line. It fell rapidly during the 26th and 27th, and, on the 31st it had fallen to six feet and four inches. The lowest stage of the month, two feet and ten inches, occurred on the 10th.

At Cincinnati, Ohio, the Ohio river rose seventeen feet and nine inches during the twenty-four hours ending at 2 p. m. of the 24th, and during the succeeding twenty-four hours it rose nine feet and four inches; it continued to rise until the 28th, on which date it reached a height of forty-nine feet and six inches above low-water mark, or within six inches of the danger-line. By 2 p. m. of the 29th it had fallen two feet below the highest point reached, and continued falling uninterruptedly until the close of the month, when it was eight feet below the highest point reached on the 28th. The lowest stage recorded during the month, ten feet and one inch, occurred on the 13th.

At Louisville, Kentucky, the Ohio rose steadily from the 24th to the 29th, reaching a point nine inches above the danger-line on the latter date; it was lowest, and stationary, from the 13th to 15th.

The Mississippi river at Saint Paul, Minnesota, was frozen from the 1st to the 10th, and from the 14th to the 31st; at La Crosse, Wisconsin, from the 16th to the 31st, and at Dubuque, Iowa, from the 18th to 31st. On the 26th an ice-dam formed in the river above Keokuk, Iowa, causing the water at that place to fall below low-water mark of 1864. The highest water at Keokuk, Iowa, five feet and nine inches, occurred on the 30th. At Saint Louis, Missouri, the highest water occurred on the 1st; at Cairo, Illinois, and Memphis, Tennessee, on the 31st; at Vicksburg, Mississippi, on the 8th and 9th; and at New Orleans, Louisiana, on the 11th and 12th. The Mississippi reached its lowest stage, at all stations between Keokuk and New Orleans, from the 21st to 31st.

The Missouri river continued low throughout the month. At Yankton, Dakota, it was frozen from the 16th to the 31st, and at Omaha, Nebraska, on the 30th and 31st.

The greatest ranges occurring in any of the rivers during the month are thirty-five feet and nine inches in the Ohio at Cincinnati, Ohio: twenty-seven feet and eleven inches in the Cumberland at Nashville, Tennessee; twenty feet and seven inches in the Mississippi at Cairo, Illinois; eighteen feet and eleven inches in the Ohio at Louisville, Kentucky.

In the following table are shown the danger-points at various river stations; the highest and lowest stages for December, 1883, with the dates of occurrence; and the monthly ranges:

Heights of rivers above low-water mark, December, 1883.

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
<i>Red River:</i>	<i>Ft. In.</i>		<i>Ft. In.</i>		<i>Ft. In.</i>	<i>Ft. In.</i>
Shreveport, Louisiana.....	29 9	25	14 2	6	8 1	6 1
<i>Arkansas:</i>						
Little Rock, Arkansas.....	33 0	9	17 6	29	5 7	11 11
Fort Smith, Arkansas.....		7	8 8	31	—2 0	10 11
<i>Missouri:</i>						
Yankton, Dakota †.....	20 0	15	1 5	1 10 5	0 9	6 0
Omaha, Nebraska †.....	16 0	29	5 1	9 10 14	2 10	2 3
Leavenworth, Kansas.....	21 0	15, 10	5 2	26	2 3	2 11
<i>Mississippi:</i>						
Saint Paul, Minnesota †.....	18 6	12	2 7	11, 13	2 6	0 1
La Crosse, Wisconsin †.....	18 0	9, 10	2 0	1, 2, 3	1 2	0 10
Dubuque, Iowa †.....	21 10	10	4 7	5, 9	3 0	1 7
Bavenport, Iowa.....	15 0	14, 15	3 2	6	2 1	1 1
Keokuk, Iowa †.....	14 6	30	5 9	21	—0 6	6 5
Saint Louis, Missouri.....	36 0	1	10 5	29	4 6	5 11
Cairo, Illinois.....	19 0	31	33 9	22	13 2	20 7
Memphis, Tennessee.....	34 0	31	23 2	23	8 9	14 5
Vicksburg, Mississippi.....	41 0	8, 9	29 9	29	18 6	11 3
New Orleans, Louisiana *.....	—2 0	11, 12	—7 0	31	—10 5	3 5
<i>Ohio:</i>						
Pittsburg, Pennsylvania.....	20 6	25	18 9	8	2 10	15 11
Cincinnati, Ohio.....	50 0	28	49 0	13	10 1	39 5
Louisville, Kentucky.....	24 0	29	24 9	13, 14, 15	5 10	18 11
<i>Cumberland:</i>						
Nashville, Tennessee.....	42 0	28	33 9	7	5 10	27 11
<i>Tennessee:</i>						
Chattanooga, Tennessee.....	33 0	28	13 0	7, 8	2 6	10 6
<i>Manongahela:</i>						
Pittsburg, Pennsylvania.....	29 0	25	18 9	8	2 10	15 11
<i>Savannah:</i>						
Augusta, Georgia.....	30 0	10	9 2	8, 9	5 0	4 2
<i>Willamette:</i>						
Portland, Oregon.....		29	10 8	24	1 5	9 3
<i>Sacramento:</i>						
Red Bluff, California.....		26	3 0	1 to 24	0 10	2 2
Sacramento, California.....		29	9 10	18 to 23	7 0	2 10
<i>Mobile:</i>						
Mobile, Alabama.....		7	15 8	15	12 0	3 8
<i>Colorado:</i>						
Yuma, Arizona.....						

* Below high-water marks of 1874 and 1883. † On 22d, below any mark on gauge. ‡ Observations interrupted by ice; see text.

ICE IN RIVERS AND HARBORS.

Penobscot river.—Bangor, Maine: navigation closed on the 16th; the "Katahdin" was the last steamer to leave this port.

Kennebec river.—Gardiner, Maine: the river froze over on the 23d.

Lake Whitney.—New Haven, Connecticut: the lake froze over on the 16th.

Hudson river.—Albany, New York: the river froze over at this place on the 16th. The last steamer to leave here was the "Drew"; and the steamer "Ellen M. Rowan" was the last boat to arrive, having forced her way through the ice on the 17th. On the 22d, the river was filled with ice from Rhinebeck southward to Poughkeepsie, and navigation north of the latter city was practically closed, although the main channel remained open from Poughkeepsie to Roundout. North of Roundout the river was closed. North of Catskill the ferry boats ceased running, and people crossed on the ice on that date. From Poughkeepsie southward the river was almost entirely free of ice, none being visible except in the vicinity of Poughkeepsie. North of Hudson the ice was five inches thick.

New York City: floating ice was observed in the river on the 21st and 24th.

Lake Ontario.—Oswego, New York: the steam barge "Saxon" left port on the 11th, being the last departure of the season. On the 22d the Oswego river was frozen over from the head of the island to the lower bridge.

Niagara river.—Buffalo, New York: the river froze over on the 24th.

Erie bay.—Erie, Pennsylvania: the bay was closed by ice during the night of the 20-21st.

Cuyahoga river.—Cleveland, Ohio: the river froze over during the night of the 16-17th.

Sandusky bay.—Sandusky, Ohio: all steamers except the "American Eagle" went into winter quarters on the 15th; navigation practically closed for the season.

Maumee river.—Toledo, Ohio: the river closed on the 17th.

Detroit river.—Detroit, Michigan: floating ice was observed in the river on the 20th and 21st.

Saint Clair and Black rivers.—Port Huron, Michigan: the Black river froze over on the 18th; floating ice in Saint Clair river on the 22d.

Thunder bay and Thunder Bay river.—Alpena, Michigan: floating ice in river and bay on the 14th; river partly frozen on 15th; bay partly frozen on 17th; navigation closed on 19th.

Saint Mary's river.—Fort Brady, Michigan: teams crossed the river on the ice from the 22d to the close of the month.

Straits of Mackinac.—Mackinaw City, Michigan: ice formed along the shores on the 14th; on the 18th the straits were covered with thin ice.

Lake Superior.—Duluth Minnesota: on the 17th the lake was frozen for a distance of three miles from the shores; on the 28th it was filled with floating ice as far as the eye could reach.

Marquette, Michigan: the steamer "Samuel Hodge" left port on the 3d, for the lower lakes, being the last departure of the season.

Lake Michigan.—Milwaukee, Wisconsin: ice formed along the shores of the lake on the 17th.

Chicago, Illinois: navigation was practically closed on the 15th.

Grand river.—Grand Haven, Michigan: drift ice was observed in the river on the 19th; on the 22d the river froze over, but the ice broke up on the 24th.

Lansing, Michigan: the river closed on the 16th.

Mississippi river.—Saint Paul, Minnesota: the river was frozen from the 1st to the 31st; on the 11th the ice melted around the harbor and near the river gauge, so that observations were made for a few days, but the harbor froze over again on the 14th.

La Crosse, Wisconsin: the river froze over on the 18th, and remained so after that date.

Dubuque, Iowa: floating ice on the 1st, 3d, 4th, 5th, and 17th; river froze over on the 19th; teams crossed on the ice on the 20th.

Davenport, Iowa: the last steamer of the season left this place on the 2d; floating ice was observed from the 3d to 18th; on the 24th the river was frozen solidly and teams crossed on the ice.

Muscatine, Iowa: the river froze over on the 19th; on the 21st teams crossed on the ice.

Burlington, Iowa: floating ice on the 15th; river closed on the 18th.

Keokuk, Iowa: navigation closed for the season on the 14th; ice-dams formed above the city on the 19th and 21st, causing the water to fall below the low-water mark of 1864 on the latter date.

Saint Louis: the first floating ice was observed on the 18th; on that date navigation was practically suspended for the season; floating ice continued until the 26th, when the river was nearly free of ice; light floating ice was observed on the Illinois side on the 27th, 28th, and 29th; on the 30th and 31st the river was clear of ice.

Cairo, Illinois: navigation between this city and Saint Louis closed on the 30th.

Des Moines river.—Des Moines, Iowa: the river froze over on the 18th.

Missouri river.—Yankton, Dakota: an ice-dam formed in the river on the 15th; the river remained frozen after the 16th.

Vermillion, Dakota: the river closed on the 17th.

Omaha, Nebraska: the river froze over on the 30th.

Rock river.—Rockford, Illinois: the river froze over on the 16th.

Ohio river.—Cincinnati, Ohio: much floating ice was observed on the 24th.

Tuscarawas river.—Canal Dover, Ohio: the river froze over on the 13th, but was again clear of ice on the 25th.

At Wellsborough, Tioga county, Pennsylvania, on the 30th, ice was reported to be about five inches thick.

FLOODS.

Galveston, Texas, 6th.—Reports from Dallas stated that that city was partly flooded by a heavy rain storm which occurred during the night of the 5-6th. A large amount of damage was done to buildings, sewers, etc. The streams in the surrounding country were much swollen, flooding the railroad tracks and delaying trains from six to eight hours.

Cincinnati, Ohio.—On the 24th the Licking river, which empties into the Ohio opposite this city, rose twenty-six feet. Many barges and other river craft were broken from their moorings and swept away by the strong current. Very heavy losses were sustained by the owners of barges, etc. The Ohio river reached its highest point on the morning of the 28th, when all the buildings nearest the river between Main street and the suspension bridge, and between Broadway and Ludlow street, were flooded.

Laconia, Harrison county, Indiana, 24th.—The Ohio river has risen about twenty feet opposite this place during the last forty-eight hours.

Vevay, Switzerland county, Indiana.—On the 24th cellars, culverts, etc., at this place were flooded and much damage was done. The Ohio river rose nearly to the top of its banks on that date, and an inundation was threatened.

Wickenburg, Arizona.—The heavy rains of the 21st and 22d caused Hassayampa creek (which in this vicinity, has been completely dry for several months) to rise to such an extent that it could not be forded. It continued high during the 23d, but it fell rapidly on the following day.

Plymouth, Grafton county, New Hampshire.—The village reservoir, having an elevation of nearly two hundred feet, was washed out during the night of the 27-28th, owing to the heavy rains which melted the snow, and caused an overflow.

HIGH TIDES.

Eastport Maine, 13th, 14th.

LOW TIDES.

New York City.—The westerly gale of the 28th caused a very low tide about the shores of Staten Island. For the second time during the past year Split Rock, off Tompkinsville, was above the water line. This rock is generally seen about once in seven years. New Creek shoals, the beach at Great Kills, and Old Orchard shoals were uncovered for several miles. The "middle grounds" off Seguine's Point were nearly dry, which is an unusual occurrence. The Staten Island ferry-boats experienced difficulty in making their landings.

Low tides also occurred at New London, Connecticut, on the 28th, and at Cedar Keys, Florida, on the 15th, 16th and 17th.

VERIFICATIONS.

INDICATIONS.

The detailed comparison of the tri-daily indications for December, 1883, with the telegraphic reports for the succeeding twenty-four hours, shows the general average percentage of verifications to be 84.90 per cent. The percentages for the four elements are: weather, 87.32; direction of the wind, 82.20; temperature, 85.09; barometer, 84.80 per cent. By geographical districts they are: for New England, 85.20; middle Atlantic states, 86.69; south Atlantic states, 82.57; eastern Gulf, 83.60; western Gulf, 85.65; lower lakes, 86.38; upper lakes, 86.04; Ohio valley and Tennessee, 84.44; upper Mississippi valley, 84.00; Missouri valley, 83.38; north Pacific, 89.77; middle Pacific, 87.00; south Pacific, 93.20.